

***Didymocyrtis epiphyscia*, *Lichenochora weillii*, and *Lichenocodium xanthoriae* newly recorded from Turkey**

MUSTAFA KOCAKAYA

Department of Organic Agriculture, Boğazlıyan Vocational School, University of Yozgat,
Bozok 66400 Yozgat , Turkey

* CORRESPONDENCE TO: mustafa.kocakaya@yobu.edu.tr

ABSTRACT—Three lichenicolous fungal species, *Didymocyrtis epiphyscia*, *Lichenochora weillii*, and *Lichenocodium xanthoriae*, are reported for the first time from Turkey. Comments on the taxonomy, ecology, and hosts and photographic illustrations are provided for each species.

KEY WORDS—biodiversity, lichens, *Lichenocodium*, *Phaeosphaeriaceae*, *Phyllachoraceae*

Introduction

The lichenicolous fungi of Turkey have received increasing attention during the last fifteen years since Hafellner & John (2006) compiled the first checklist recognizing 63 taxa. Halıcı (2008) published an updated list and key for the 117 known taxa of lichenicolous *Ascomycota* (including mitosporic fungi), and subsequent papers have published new records (Halıcı & al. 2012; Kocakaya & al. 2016a, 2018, 2020) and new species (Kocakaya & al. 2016b, Hawksworth & al. 2016).

Among the c. 200 lichenicolous fungi species currently known from Turkey, *Lichenocodium* Petr. & Syd. is represented by six species, *Lichenochora* Hafellner by three species, and *Didymocyrtis* Vain. by one species (John & Türk 2017, Yazıcı & al. 2011). Here, I report the presence of three additional species from those genera and provide interesting information on their anatomy and ecology.

Material & methods

All specimens were collected in Çamlık National Park (Yozgat) during 2018–19. Çamlık National Park is Turkey's first National Park. As a national park, it is a well-preserved area, with oak (*Quercus pubescens*) and hawthorn (*Crataegus orientalis*) woods dominating the lower parts, while the higher elevations are occupied by *Pinus nigra* forests. Lichenicolous fungi are more common in preserved areas.

Vouchers are stored at the lichen herbarium of Yozgat Bozok University, Science and Art Faculty, Yozgat, Turkey, 66400 Yozgat, Turkey (YBUL); herbarium accession numbers are given in parentheses after locality details. Specimens were examined in water, 10% KOH, Lugol's, and Meltzer's iodine solutions. Spores were generally measured in water mounts. The specimens were examined with an Olympus SZX16 stereomicroscope and an Olympus BX53 light microscope. Micro- and macrophotographs were taken with an Olympus DP72 digital microscope camera with c-mount interface and with a 5-megapixel CCD.

New records

Didymocyrtis epiphyscia Ertz & Diederich,

Fungal Diversity 74: 71 (2015)

FIG. 1A,B

Conidiomata superficial and aggregated on host apothecia, black, $\leq 150\ \mu\text{m}$. Conidiogenous cells ampulliform, aseptate, hyaline, $3\text{--}6\ \mu\text{m}$. Conidiospores simple, hyaline, ellipsoid, with usually one or two small guttules, $4\text{--}7 \times 3.5\text{--}5\ \mu\text{m}$ ($n = 50$). The lichenicolous fungus host apothecia blacken when infected (FIG. 1A).

SPECIMEN EXAMINED—TURKEY. YOZGAT, Çamlık National Park, $39^{\circ}48'04''\text{N}$ $34^{\circ}48'49''\text{E}$, 1615 m, on apothecia of *Physcia stellaris* (L.) Nyl., 20 July 2019, M. Kocakaya MK-4114 (YBUL).

COMMENTS—The Turkish specimen was found growing on the apothecia of *Physcia stellaris* on *Quercus* spp. Ertz & al. (2015) segregated *D. epiphyscia* s.lat. on *Physcia adscendens* and *P. tenella* from genetically related *D. epiphyscia* s.str. on *Physcia aipolia* based on consistently narrower conidia— $3.7\text{--}8.0 \times 2.0\text{--}3.5\ \mu\text{m}$ in *D. epiphyscia* s.lat. and $4.0\text{--}7.8 \times 3.2\text{--}5.0\ \mu\text{m}$ in *D. epiphyscia* s.str. Our specimen completely matches the description of *D. epiphyscia* s.str. (Ertz al. 2015).

Didymocyrtis epiphyscia has also been reported from other host genera, e.g., on *Physconia distorta* (Hawksworth 1981), *Phaeophyscia orbicularis* (Brackel 2011), and *Parmelia sulcata* (Brackel 2007, 2009; Zhurbenko & al. 2012). The species has previously been reported from Austria, France, Scotland, Luxembourg, and Canada (Ertz & al. 2015) as well as *Phoma physciicola* Keissl. from Russia (Zhurbenko & Tugi 2013).

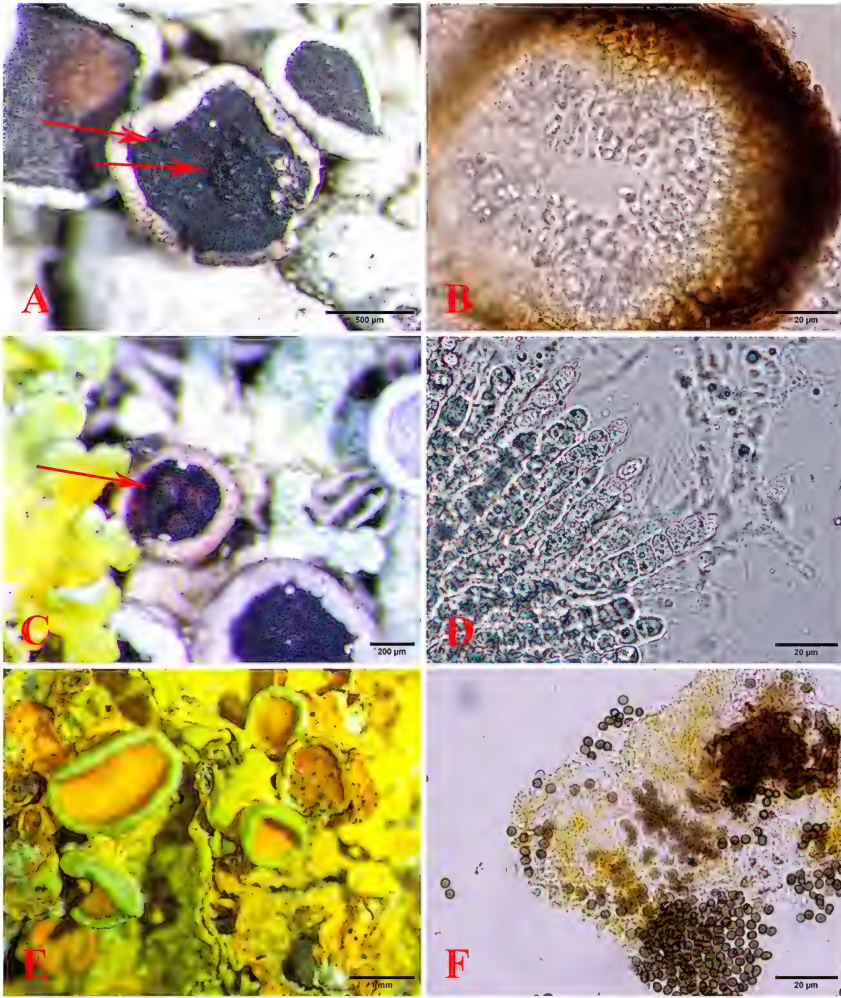


FIG. 1. *Didymocyrtis epiphyscia* (MK-4114): A. Perithecia on apothecia of *Physcia stellaris*; B: Conidia. *Lichenochora weillii* (MK-3822): C. Perithecia on *Physcia tenella*; D. Ascus and ascospores. *Licheniconium xanthoriae* (MK-3830): E. Conidiomata on apothecia of *Xanthoria parietina*; F. Conidia.

The sole *Didymocyrtis* species previously reported from Turkey represents *D. foliaceiphila* (Diederich & al.) Ertz & Diederich, which differs by its narrowly ellipsoid conidia, immersed pycnidia, and *Cladonia* host (Ertz & al. 2015; Kocakaya & al. 2018).

Lichenochora weillii (Werner) Hafellner & R. Sant.,

Nova Hedwigia 48(3–4): 369 (1989)

FIG. 1C,D

Perithecia subglobose to globose, immersed-subimmersed to erumpent in the ostiolar region, 150–200 μm , aggregated in groups. Ascus 8-spored, 70–100 $\times$ 10–16 μm ($n = 20$), with spores are organized in a single row in ascus. Ascospores hyaline, 1-septate, slightly constricted at the septum, smooth-walled, with many guttules in each cell, 9–12 $\times$ 7–9 μm ($n = 60$).

SPECIMENS EXAMINED—TURKEY. YOZGAT, Çamlık National Park, 39°48'02"N 34°48'46"E, 1635 m, on apothecia of *Physcia tenella* (Scop.) DC., 22 July 2018, M. Kocakaya MK-3822 (YBUL); 39°48'20"N 34°48'51"E, 1490 m, on apothecia of *Physcia* sp. 22 July 2018, M. Kocakaya MK-3860 (YBUL).

COMMENTS—Our specimens represent the first report of *L. weillii* on *Physcia* hosts. One Turkish specimen was collected from apothecia of *Physcia tenella* on *Acer* spp.; this host is quite common in Turkey (John & Türk 2017). Ascospore sizes vary in the species; they are cited as 7–11 $\times$ 5–6 μm by Werner (1937) but as 10–12 $\times$ 8–9.5 μm by Hafellner (1989); our specimen matches Hafellner's specimen more closely. Previous studies suggest that *Lichenochora weillii* always develops on *Physconia* spp. (Hafellner 1989; Gromakova 2018; Khodosovtsev & al. 2019), but all the characteristics of our specimens match the original description. *Lichenochora thallina* rarely develops on *Physcia*, but it has longer and narrower ascospores than *L. weillii* (Hafellner 1989). *Lichenochora weillii*, which was originally described by Werner (1937) from Spain, has also been reported from Belgium (Ertz & al. 2008), Svalbard (Zhurbenko & Brackel 2013), Sweden, North America (Hafellner 1989), and Ukraine (Gromakova 2018; Khodosovtsev & al. 2019).

Lichenochora species previously reported from Turkey include *L. aprica*, Hafellner & Nik. Hoffm., *L. atrans* Halıcı & al., and *L. verrucicola* (Wedd.) Nik. Hoffm. & Hafellner (John & Türk 2017, Yazıcı & Aslan 2019).

Licheniconium xanthoriae M.S. Christ.,

Friesia 5(3–5): 212 (1956)

FIG. 1E, F

Pycnidia immersed to erumpent, black, subglobose, (100–)150(–200) μm in diam.; conidiospores dark brown, simple, subglobose, almost smooth to slightly verruculose, 3–6 $\times$ 3–5 μm ($n = 48$). The lichenicolous fungus causes slightly whitening on the host apothecia and thallus (FIG. 1E).

SPECIMEN EXAMINED—TURKEY. YOZGAT, Çamlık National Park, 39°48'20"N 34°48'51"E, 1490 m, on apothecia of *Xanthoria parietina*, 22 July 2018, M. Kocakaya MK-3830 (YBUL).

COMMENTS—The Turkish specimen was found growing on the apothecia of *Xanthoria parietina* on *Quercus* spp. The host of the type specimen is *Xanthoria parietina* (Christiansen 1956), but it has also been recorded on other unrelated lichen genera (Brackel 2008; Kocourkova 2000; Triebel & al. 1991). This species was previously reported from Austria (Etayo & Berger 2009), Italy (Brackel 2008), Russia (Himmelbrant & al. 2013), and USA (Haldeman 2019).

Lichenocnium species previously reported from Turkey are *L. aeruginosum* Diederich & al., *L. erodens* M.S. Christ. & D. Hawksw., *L. lecanorae* (Jaap) D. Hawksw., *L. lichenicola* (P. Karst.) Petr. & Syd., *L. pyxidatae* (Oudem.) Petr. & Syd., and *L. usneae* (Anzi) D. Hawksw. (John & Türk 2017; Yazıcı & al. 2011).

Acknowledgements

The manuscript was reviewed by Sergio Perez Ortega (Real Jardín Botánico, Madrid, Spain) and Raquel Pino Bodas (Royal Botanic Gardens, Kew, UK).

Literature cited

- Brackel WV. 2007. Zur Flechtenflora der Serpentinittfelsen in Nordostbayern. Hoppea, Denkschriften der Regensburgischen Botanischen Gesellschaft 68: 253–268.
- Brackel WV. 2008. *Zwackhiomyces echinulatus* sp. nov. and other lichenicolous fungi from Sicily, Italy. Herzogia 21: 181–198.
- Brackel WV. 2009. Weitere Funde von flechtenbewohnenden Pilzen in Bayern—Beitrag zu einer Checkliste IV. Berichte der Bayerischen Botanischen Gesellschaft 79: 5–55.
- Brackel WV. 2011. Lichenicolous fungi and lichens from Puglia and Basilicata (southern Italy). Herzogia 24: 65–101. <https://doi.org/10.13158/heia.24.1.2011.65>
- Christiansen MS. 1956. A new species of the form-genus *Lichenocnium* Petr. & Syd. (fungi imperfecti), *L. xanthoriae* sp. n. Friesia 5(3–5): 212–217.
- Ertz D, Diederich P, Brand AM, Boom P van den, Sérusiaux E. 2008. New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. XI. Bulletin de la Société des Naturalistes Luxembourgeois 109: 35–51.
- Ertz D, Diederich P, Lawrey JD, Berger F, Freebury CE, Coppins B, Gardiennet A, Hafellner J. 2015. Phylogenetic insights resolve *Dacampiaceae* (Pleosporales) as polyphyletic: *Didymocyrtis* (Pleosporales, Phaeosphaeriaceae) with *Phoma*-like anamorphs resurrected and segregated from *Polycoccum* (Trypetheliales, Polycoccaceae fam. nov.). Fungal Diversity 74: 53–89. <https://doi.org/10.1007/s13225-015-0345-6>
- Etayo J, Berger F. 2009. About a fast developing community of lichenicolous deuteromycetes decaying *Xanthoria parietina*. Österreichische Zeitschrift für Pilzkunde 18: 111–115.
- Gromakova AB. 2018. New records of lichens and lichenicolous fungi from Eastern Ukraine. Chornomors'k. bot. z. 14: 269–278. <https://doi.org/10.14255/2308-9628/18.143/5>
- Haldeman M. 2019. New and interesting records of lichens and lichenicolous fungi from northwestern USA II. Evansia 36(3), 63–71. <https://doi.org/10.1639/0747-9859-36.3.63>
- Hafellner J. 1989. Studien über lichenicole Pilze und Flechten. VII: über die neue Gattung *Lichenochora* (Ascomycetes, Phyllachorales). Nova Hedwigia 48: 357–370.
- Hafellner J, John, V. 2006. Records of lichenicolous non-lichenized fungi from Turkey, including a synopsis of the taxa so far recorded in the country. Herzogia 19: 155–176.

- Halıcı MG. 2008. A key to the lichenicolous *Ascomycota* (including mitosporic fungi) of Turkey. *Mycotaxon* 104: 253–286.
- Halıcı MG, Candan M, Türk A. 2012. A key to the peltigericolous fungi in Turkey. *Mycotaxon* 119: 277–289. <https://doi.org/10.5248/119.277>
- Hawksworth DL. 1977. Taxonomic and biological observations on the genus *Lichenosconium* (*Sphaeropsidales*). *Persoonia* 9: 159–198.
- Hawksworth DL. 1981. The lichenicolous coelomycetes. *Bulletin of the British Museum (Natural History) Botany* 9: 1–198.
- Hawksworth DL, Halıcı MG, Kocakaya Z, Kocakaya M. (2016). *Henfellra muriformis* gen et sp nov a new dictyosporous pycnidial fungus on *Candelariella* with a key to the lichenicolous fungi known from that genus. *Herzogia*, 29(2): 329–336. <https://doi.org/10.13158/heia.29.2.2016.329>
- Himelbrant DE, Motiejūnaitė J, Pykala J, Schiefelbein U, Stepanchikova IS. 2013. New records of lichens and allied fungi from the Leningrad Region, Russia. IV. *Folia Cryptogamica Estonica* 50: 23–31. <https://doi.org/10.12697/fce.2013.50.04>
- John V, Türk A. 2017. Türkiye likenleri listesi. Nezahat Gökyiğit Botanik Bahçesi Yayını.
- Khodosovtsev AY, Darmostuk VV, Khodosovtseva YA, Gaychenya YV. 2019. The lichens and lichenicolous fungi of Trykraty granite massive (Ukraine). *Chornomors'kii Botanichnii Zhurnal* 15(1): 54–68. <https://doi.org/10.32999/ksu1990-553X/2019-15-1-6>
- Kocakaya M, Halıcı MG, Pino Bodas R. 2016a. New or additional cladoniicolous fungi for Turkey. *Turkish Journal of Botany* 40: 308–311. <https://doi.org/10.3906/bot-1502-8>
- Kocakaya Z, Halıcı MG, Kocakaya M. 2016b. *Phoma candelariellae* sp. nov., a lichenicolous fungus from Turkey. *Mycotaxon* 130: 1185–1189. <https://doi.org/10.5248/130.1185>
- Kocakaya M, Kocakaya Z, Kaya D, Barak MÜ. 2018. A new lichenicolous fungus record from the Turkey, *Tremella macrobasidiata* (*Basidiomycota*, *Tremellales*). *Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü Dergisi* 22: 95–97. <https://doi.org/10.19113/sdufbed.36932>
- Kocakaya Z, Kocakaya M, Barak MÜ. 2020. A new lichenicolous fungus record from the Çamlık National Park (Yozgat, Turkey), *Tremella candelariellae* (*Basidiomycota*, *Tremellales*). *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi* 23: 388–390.
- Kocourkova J. 2000. Lichenicolous fungi of the Czech Republic: The First Commented Checklist. *Triebel D, Rambold G, Nash TH. 1991. On lichenicolous fungi from continental North America. Mycotaxon* 42: 263–296.
- Werner RG. 1937. Recherches phytogéographiques comparées sur la flore cryptogamique de l'Espagne méridionale et du Maroc. *Bulletin de la Société des Sciences Naturelles du Maroc* 17: 32–65.
- Yazıcı K, Aslan A. 2019. Three new lichenicolous fungi records for Turkey and Asia. *Acta Botanica Hungarica* 61: 205–212 <http://dx.doi.org/10.1556/034.61.2019.1-2.11>
- Yazıcı K, Etayo J, Aslan A. 2011 A note about lichenicolous fungi from Ardahan (Turkey). *Cryptogamie, Mycologie* 32: 429–437. <http://dx.doi.org/10.7872/crym.v32.iss4.2011.429>
- Zhurbenko MP, Brackel W. 2013. Checklist of lichenicolous fungi and lichenicolous lichens of Svalbard, including new species, new records and revisions. *Herzogia* 26: 323–359. <https://doi.org/10.13158/heia.26.2.2013.323>
- Zhurbenko MP, Tugi EW. 2013. Some noteworthy lichenicolous fungi from Khabarovsk Territory of Russia. *Mycosphere* 4(1): 46–51. <https://doi.org/10.5943/mycosphere/4/1/3>
- Zhurbenko MP, Hermansson J, Pystina TN. 2012. Lichenicolous fungi from the Komi Republic of Russia. II. *Folia Cryptogamica Estonica* 49: 89–91. <https://doi.org/10.12697/fce.2013.50.12>